

REMARKS

Examiner D. Zarneke, is thanked for the thorough examination and search of the subject Patent Application. Claims 13 and 18 has been amended. Claims 1-12 remain canceled per the restriction requirement.

The making FINAL of the Restriction requirement is noted. Non-elected Claims 1-12 are hereby canceled. A divisional application will be filed to Claims 1-12 once the elected Claims are allowed.

All Claims are believed to be in condition for Allowance, and that is so requested.

Reconsideration of Claims 13-24 rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent 6,426,281) in view of Yamai (JP 409045691) in view Forehand et al (U.S. 5,847,936) and in view Marrs (U.S. 5,795,818) is requested based on Amended Claims 13 and 18 and on the following remarks.

Applicant agrees with the Examiner that Lin et al describes a solder bump structure for an integrated circuit device.

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However, Lin et al differs from Applicant's claimed invention, as recited particularly in Amended Claims 13 and 18, with respect to an important feature. In particular, Applicant's claimed invention features a solder bump structure with a pillar 38 and 40 and a solder bump 42 where the pillar structure specifically comprises two metals 38 and 40 and where the top pillar metal 40 overhangs the vertical edges of the bottom pillar metal 38. All of these features are shown in Applicant's Figs. 3 and 4. Further, all of these features are recited in Amended Claims 13 and 18. In particular, Amended Claim 13 now reads:

13. (Currently Amended) A semiconductor device package, comprising:

a semiconductor device, said device having been provided with points of electrical contact in an active surface thereof, said points of electrical contact having
5 been provided with fine pitch, high reliability solder bumps, said solder bumps extending from said active surface of said semiconductor device over a height of columns of pillar metal, said columns of pillar metal being in contact
10 with said points of electrical contact provided in the active surface of said semiconductor device wherein said pillar metal comprises two metal layers, and wherein top

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said metal layer overhangs vertical edges of bottom said

metal layer ~~said solder bumps extend over said pillar metal~~

15 ~~by at least 0.2 microns;~~

a Ball Grid Array substrate, said BGA substrate having been provided with points of electrical contact over a

first and a second surface thereof, said points of BGA

substrate being connected to interconnect lines provided

20 over the second surface of said BGA substrate;

a solder mask provided over said second surface of said BGA substrate;

said device being positioned over the second surface of said BGA substrate, said fine pitch, high reliability

25 solder bumps facing said second surface of said BGA

substrate, providing contact between said fine pitch, high

reliability solder bumps and said points of electrical

contact provided over said second surface of said BGA

substrate;

30 electrical contact having been established between

said fine pitch, high reliability solder bumps and said

points of electrical contact provided over said second

surface of said BGA substrate by a process of solder

reflow;

35 said semiconductor device being encapsulated in a

molding compound, said molding compound surrounding said

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device on all sides including said active surface of said device;

contact balls making electrical contact with said
40 points of electrical contact provided over said first surface of said BGA substrate; and

electrical contact having been established between said solder balls inserted into said solder mask provided over said first surface of said BGA substrate and said
45 points of electrical contact provided over said first surface of said BGA substrate by a process of solder reflow.

Claim 18 has been similarly amended.

Applicant has carefully reviewed the primary reference of Lin et al. Lin et al shows, in the preferred embodiment illustrated in Fig. 17, a solder bump structure that could be interpreted as having a pillar. In this case, the solder bump is layer 50 and the pillar is made up of layers 46 and 48. However, this structure differs significantly from Applicant's claimed invention as recited in Claims 13 and 18. Clearly, the structure of Lin et al shows the top pillar metal 48 and the bottom pillar metal 46 as having aligned vertical edges. The fact that the vertical edges of the pillar metals 46 and 48 is made more clear

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by Figs. 13 and 14 where the edges of these metal layers 46 and 48 are defined by a common masking layer 49. By comparison, in Applicant's Figs. 3 and 4, the top pillar layer 40 is clearly overhanging the bottom pillar layer 38.

Applicant has further carefully reviewed the cited art of Yamai, Forehand et al, and Marrs and has found that none of these references teach or suggest this key feature of Applicant's claimed invention. Further, it appears to the Applicant that Lin et al, Yamai, Forehand et al, and Marrs, separately or in combination, fail to teach or suggest this key feature in such a way as to allow one skilled in the art at the time of the invention to have practiced the invention. Therefore, Applicant believes that the claimed invention, as recited in Amended Claims 13 and 18, is patentable over the cited art. Applicant therefore respectfully requests that the rejection of Claims 13 and 18 under 35 USC 103(a) be removed in the light of the above analysis. Further, Claims 14-17 and 19-24 represent patentably distinct, further limitations on Claims 13 and 18 that should not be rejected under 35 USC 103(a) if the rejections of Claims 13 and 18 are removed.

Reconsideration of Claims 13-24 rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent

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6,426,281) in view of Yamai (JP 409045691) in view Forehand et al (U.S. 5,847,936) and in view Marrs (U.S. 5,795,818) is requested based on Amended Claims 13 and 18 and on the above remarks.

Reconsideration of Claim 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent 6,426,281) in view of Yamai (JP 409045691) in view Forehand et al (U.S. 5,847,936) and in view Marrs (U.S. 5,795,818) and further in combination with Pao et al (U.S. 5,931,371) is requested based on Amended Claim 13 and on the following remarks.

Applicant applies the same analysis given above regarding the rejection of Claims 13-24 and additionally finds that the cited art of Pao et al does not teach or suggest the key feature of Applicant's claimed invention as described above. Further, it appears to the Applicant that Lin et al, Yamai, Forehand et al, Marrs, and Pao et al separately or in combination, fail to teach or suggest this key feature in such a way as to allow one skilled in the art at the time of the invention to have practiced the invention. Therefore, Applicant believes that the claimed invention, as recited in Amended Claims 13 and 18, is patentable over the cited art. Applicant therefore respectfully requests that the rejection of Claim 13 under 35 USC 103(a) be

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removed in the light of the above analysis. Further, Claim 17 represents a patentably distinct, further limitation on Claim 13 that should not be rejected under 35 USC 103(a) if the rejections of Claim 13 is removed.

Reconsideration of Claim 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al (US Patent 6,426,281) in view of Yamai (JP 409045691) in view Forehand et al (U.S. 5,847,936) and in view Marrs (U.S. 5,795,818) and further in combination with Pao et al (U.S. 5,931,371) is requested based on Amended Claim 13 and on the above remarks.

Applicants have reviewed the prior art made of record and not relied upon and have discussed their impact on the present invention above.

Allowance of all Claims is requested.

It is requested that should the Examiner not find that the Claims are now Allowable that the Examiner call the undersigned at 989-894-4392 to overcome any problems preventing allowance.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'S. B. Ackerman', with a large, stylized 'Q' or 'R' as a flourish at the end.

Stephen B. Ackerman, Reg. No. 37,761